

Amendments to the Claims

Please make the following amendments to the claims:

1. (Currently Amended) An apparatus for maintaining data in an electronic storage array during multiple drive failures, the apparatus comprising:

a primary response module configured to recognize a failure of a first drive of a plurality of storage drives forming volume set accessible to a storage controller and to enter a first operating mode in response to the failure of the first drive, the first operating mode comprising placing the first drive in an off-line state and placing the volume set in a modified read/write mode using non-failed drives of the volume set; and

a secondary response module configured to recognize a failure of a second drive of the volume set and to enter a second operating mode in response to the failure of the second drive, the second operating mode comprising placing the drives of the volume set in a read-only mode with the failed second drive in a degraded state wherein the storage controller attempts to read requested data from the failed second drive and from a pinned data drive in response to the requested data being unavailable from the failed second drive.
2. (Currently Amended) The apparatus of claim 1, wherein the primary response module is further configured to place the first drive in an off-line state volume set in a critical state.

3. (Currently Amended) The apparatus of claim 4, wherein the secondary response module is further configured to place the second drive in a degraded state further comprising notifying a user that the volume set is in a critical state.
4. (Currently Amended) The apparatus of claim 3, 1, wherein the second drive is made accessible for controlled read operations while in the degraded state the primary response module returns the volume set to a normal state in response to the first failed drive being rebuilt and the secondary response module not detecting a second drive failure.
5. (Currently Amended) The apparatus of claim 1, further comprising a pinned data module configured to store write data intended for storage on the volume set on-a the pinned data drive without storing the write data on a drive of the volume set during employment of the second operating mode.
6. (Currently Amended) The apparatus of claim 5, wherein the pinned data drive is a system cache of the electronic storage array storage controller with access to the volume set.
7. (Currently Amended) The apparatus of claim 5, wherein the pinned data drive is a spare drive of the electronic storage array volume set.
8. (Currently Amended) The apparatus of claim 5, wherein the pinned data module is further configured to map a first data location on the pinned data drive to a second data location

on another drive within the electronic storage array volume set.

9. (Original) The apparatus of claim 1, further comprising a recovery module configured to at least partially rebuild data of the first and second drives.
10. (Original) The apparatus of claim 9, wherein the recovery module is further configured to at least partially rebuild the data of the first drive on a spare drive of the electronic storage array.
11. (Original) The apparatus of claim 9, wherein the recovery module is further configured to at least partially rebuild the data of the second drive using data stored on a pinned data drive.
12. (Original) The apparatus of claim 1, further comprising a tracking module configured to create a bad block table and a bad stripe table and store a bad block identifier and a bad stripe identifier in the respective tables, the bad block identifier and bad stripe identifiers identifying the location of suspect data on one of the first and second drives.
13. (Original) The apparatus of claim 12, wherein the tracking module is further configured to maintain the bad block identifier and the bad stripe identifier of the location of the suspect data until the data stored in the location is no longer suspect.

14. (Currently Amended) A system for maintaining data in an electronic storage array during multiple drive failures, the system comprising:

a storage area network having a storage controller that controls storage of network data on a plurality of storage drives, the plurality of storage derives forming an electronic storage array a volume set;

a primary response module configured to recognize a failure of a first drive of the plurality of storage drives and to enter a first operating mode in response to the failure of the first drive and to place the first drive in an off-line state and placing the plurality of storage drives in a modified read/write mode using non-failed drives of the plurality of storage drives;

a secondary response module configured to recognize a failure of a second drive of the plurality of storage drives and to enter a second operating mode in response to the failure of the second drive and to place the second drive in a degraded state wherein the storage controller attempts to read requested data from the failed second drive and from a pinned data drive in response to the requested data being unavailable from the failed second drive;

a read module configured to modify a host read command to one of the plurality of storage drives during the employment of the second operating mode;

a write module configured to modify a host write command to one of the plurality of storage drives during the employment of the second operating mode;

a pinned data module configured to store write data intended for storage on the volume set on-a the pinned data drive without storing the write data on a drive of the volume set during employment of the second operating mode; a recovery module configured to at least partially rebuild data of the first and second drives; and a tracking module configured to create a bad block table and a bad stripe table and store a bad block identifier and a bad stripe identifier in the respective tables, the bad block identifier and bad stripe identifiers identifying the location of suspect data on one of the first and second drives.

15. (Currently Amended) A process for maintaining data in an electronic storage array during multiple drive failures, the process comprising:

recognizing a failure of a first drive of a plurality of storage drives forming volume set accessible to a storage controller and entering a first operating mode in response to the failure of the first drive, the first operating mode comprising placing the first drive in an off-line state and placing the volume set in a modified read/write mode using non-failed drives of the volume set; and recognizing a failure of a second drive of the volume set and entering a second operating mode in response to the failure of the second drive, the second operating mode comprising placing the drives of the volume set in a read-only mode with the failed second drive in a degraded state wherein the

storage controller attempts to read requested data from the failed second drive and from a pinned data drive in response to the requested data being unavailable from the failed second drive.

16. (Currently Amended) The process of claim 15, wherein entering a first operating mode further comprises placing the first drive in an off line state further comprising storing write data on the pinned data drive during employment of the second operating mode.
17. (Currently Amended) A computer readable storage medium comprising computer readable code configured to carry out a process for maintaining data in an electronic storage array during multiple drive failures, the process comprising:

recognizing a failure of a first drive of a plurality of storage drives forming volume set accessible to a storage controller and entering a first operating mode in response to the failure of the first drive, the first operating mode comprising placing the first drive in an off-line state and placing the volume set in a modified read/write mode using non-failed drives of the volume set; and

recognizing a failure of a second drive of the volume set and entering a second operating mode in response to the failure of the second drive, the second operating mode comprising placing the drives of the volume set in a read-only mode with the failed second drive in a degraded state wherein the storage controller attempts to read requested data from the failed second drive

and from a pinned data drive in response to the requested data being unavailable from the failed second drive.

18. (Currently Amended) The computer readable storage medium of claim 17, wherein entering a first operating mode further comprises placing the first drive in an off line state volume set in a critical state.
19. (Currently Amended) The computer readable storage medium of claim 17, wherein ~~entering the second operation mode further comprises placing the second drive in a degraded state further comprising notifying a user that the volume set is in a critical state.~~
20. (Currently Amended) The computer readable storage medium of claim 17, wherein ~~placing the second drive in a degraded state comprises making the second drive accessible for controlled read operations while in the degraded state further comprising returning the volume set to a normal state in response to the first failed drive being rebuilt and the secondary response module not detecting a second drive failure.~~
21. (Currently Amended) The computer readable storage medium of claim 17, further comprising storing write data intended for storage on the volume set on ~~a~~ the pinned data drive ~~without storing the write data on a drive of the volume set~~ during employment of the second operating mode.

22. (Currently Amended) The computer readable storage medium of claim ~~20~~21, wherein storage write data on a pinned data drive comprises storing data on a system cache of the ~~electronic storage array~~ storage controller with access to the volume set.

23. (Currently Amended) The computer readable storage medium of claim ~~20~~21, wherein storage write data on a pinned data drive comprises storing data on a spare drive of the ~~electronic storage array~~ volume set.

24. (Currently Amended) The computer readable storage medium of claim ~~20~~21, further comprising mapping a first data location on the pinned data drive to a second data location on another drive within the ~~electronic storage array~~ volume set.

25. (Original) The computer readable storage medium of claim 17, further comprising at least partially rebuilding data of the first and second drives.

26. (Currently Amended) The computer readable storage medium of claim ~~24~~25, further comprising at least partially rebuilding the data of the first drive on a spare drive of the electronic storage array.

27. (Currently Amended) The computer readable storage medium of claim ~~24~~25, further comprising at least partially rebuilding the data of the second drive using data stored on a pinned data drive.

28. (Original) The computer readable storage medium of claim 17 further comprising creating a bad block table and storing a bad block identifier and a bad stripe identifier in the respective tables, the bad block identifier and bad stripe identifiers identifying the location of suspect data on one of the first and second drives.

29. (Currently Amended) The computer readable storage medium of claim of-25 28, further comprising marinating maintaining the bad block identifier and the bad stripe identifier of the location of the suspect data until the data stored in the location is no longer suspect.

30. (Currently Amended) An apparatus for maintaining data in an electronic storage array during multiple drive failures, the apparatus comprising:
means for recognizing a failure of a first drive of a plurality of storage drives forming volume set accessible to a storage controller and entering a first operating mode in response to the failure of the first drive, the first operating mode comprising placing the first drive in an off-line state and placing the volume set in a modified read/write mode using non-failed drives of the volume set;
and
means for recognizing a failure of a second drive of the volume set and entering a second operating mode in response to the failure of the second drive, the second operating mode comprising placing the drives of the volume set in a read-only mode with the failed second drive in a degraded state wherein the

storage controller attempts to read requested data from the failed second drive
and from a pinned data drive in response to the requested data being
unavailable from the failed second drive.